

Intel Developer Update is Intel's monthly online news magazine for developers. As the official publication of developer.intel.com, it brings hardware, software, and Web developers the latest information on Intel initiatives, technologies, platforms, and products.

### Cover Story

Each month, we run a cover story on the most significant industry announcement, trend, or development for the month.

### Featured Articles

Delivering in-depth reports on key platforms, products and technologies, our featured articles provide a monthly source of information on issues affecting developers. Be sure to check in every month for the latest developments driving the evolution of the industry.

### Contact the Editor

To make *Intel Developer Update* a better information resource, we invite you to share your thoughts on what we've published or what you'd like to see covered. Comments are always welcome.

### Archives

Our archives contain two groups of previously published articles. One group contains all the articles that appeared in *Platform Solutions News*, the earlier version of *Intel Developer Update*. The articles date from September 1997 through August 1999. The other group is set up to contain *Intel Developer Update* articles dating from the inaugural September/October 1999 issue.

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*On behalf of all of us at Intel Developer Update, welcome to the future of the PC platform!*

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## **Cover Story**

### **CDSA Brings Security into the Open**

Lelia Barlow  
Technical Marketing Engineer  
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Intel Corporation

#### **Overview**

No one denies that information security is important and necessary. The question is not *whether* to implement a security solution, but *how*. Intel has helped solve that problem by developing a comprehensive security framework ... and making it open source.

#### **Consider a Scenario**

A business wants to employ biometrics to enhance security in several sensitive areas. The research and design group uses an iris scanner in the lab, network administrators use fingerprint scanners, and a disabled employee's needs are best met by using voice recognition.

Typically, when software developers choose to include security features in their products, they tie an application to a single technology and a single vendor. Businesses that use these solutions must either forego superior security offerings as they emerge, or face an application migration. Clearly, both are unacceptable choices.

The Common Data Security Architecture (CDSA) was designed to help solve these problems by providing a standard interface to existing and future security technologies. Created by Intel and adopted by The Open Group\*, a premier API standards organization, CDSA gives applications access to a variety of security resources, regardless of platform, operating system, or type of service.

In this scenario, a single CDSA-based application can decide which biometric authentication to utilize based on the user's identification. So the R&D group uses the iris scanner, network administrators use fingerprint scanners, and the special needs employee uses voice recognition.

#### **A Standard API**

CDSA is a mature technology, and it has benefited by extensive industry review for more than three years. CDSA, conceived and implemented by Intel Architecture Labs (IAL), was originally adopted by The Open Group in 1997, and an enhanced version of the specification has recently been adopted by The Open Group. In May 2000, Intel plans to deliver Release 3.0 of the CDSA reference implementation, which will fully implement this enhanced specification. Because Intel has embraced the open source model to ensure broad adoption of CDSA technology, this implementation will be available for free download and use, and will allow companies to deploy CDSA technology to grow e-Business at no extra cost.

CDSA gives application developers access to security services by implementing a "middleware" layer between applications and security services. Instead of writing an application for a specific security service, developers write to a standard application programming interface (API). Stable, well documented APIs allow rapid adoption of emerging technologies, lower application development cost, and reduce time-to-market by allowing developers to stay focused on enhancing their applications rather than dealing with the difficult challenges of building discrete security solutions.

#### **CDSA Architecture**

The CDSA specification defines an open, extensible architecture that is horizontally broad and vertically robust. The heart of CDSA is the Common Security Services Manager (CSSM), which is an openly published API that applications use to gain access to security features. CSSM delivers security features from service provider modules. Five basic service provider modules integrate into the CDSA environment. These are:

- *Cryptographic Service Provider (CSP) modules*—CSPs perform cryptographic operations such as bulk encrypting, digesting, and digital signatures. They also store private keys.

- *Trust Policy (TP) modules*—TPs implement policies defined by authorities and institutions and set the level of trust required to carry out specific actions (such as gaining access to intellectual property).
- *Authorization Computation (AC) modules*—ACs define a general authorization evaluation service that computes whether a set of credentials and samples is authorized to perform a specific operation on a specific object.
- *Certificate Library (CL) modules*—CLs provide syntactic manipulation of stored certificates and revocation lists, and access to remote signing capabilities such as Certification Authorities (CA).
- *Data Storage (DL) modules*—DLs provide stable storage for security-related data objects, including certificates, cryptographic keys and policy objects. The actual storage can be in a commercially available database, a native file system, a custom hardware device, or other devices.

In addition, CDSA has the ability to be “extensible,” which means it can expand to incorporate new categories of services using the CDSA Elective Module Manager (EMM). As an example, the Biometrics industry is rallying around CDSA to enable the broad use of biometric devices, and they are using the EMM capability of CDSA to deliver Human Recognition Services (HRS) as part of CDSA. See Figure 1.

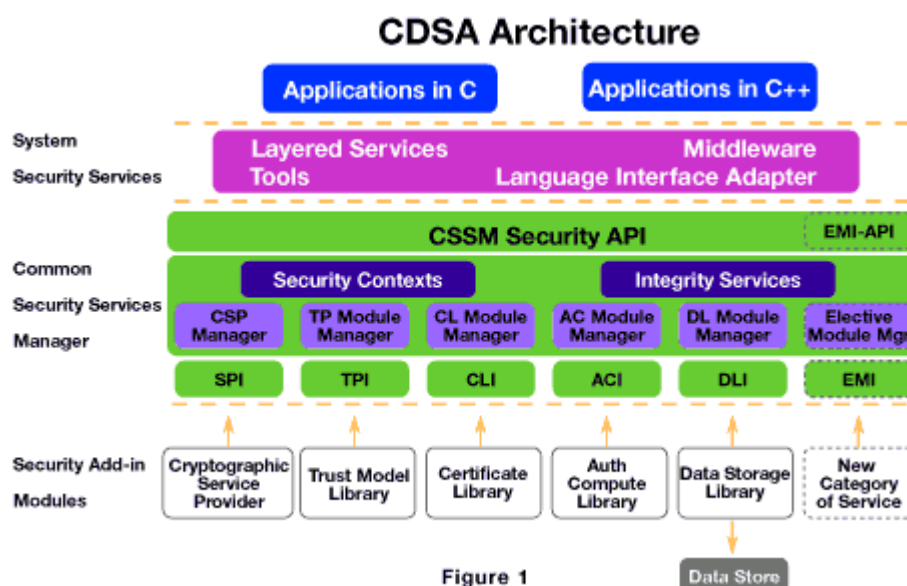


Figure 1

### Interoperable...

The benefits of CDSA extend across platforms and operating systems. Desktop and mobile PCs, workstations, servers, and Internet appliances can all use CDSA technology to access a wide variety of security services and functionality. In addition, CDSA has gained widespread OS support. CDSA was designed to operate in Windows\*, Linux\*, UNIX\*, Mac OS\*, and other environments. The result: a company with a mix of Windows desktops, Linux servers, UNIX workstations, and Mac OS notebook computers can access the same set of security services with CDSA-compliant applications.

CDSA enables a wide variety of security services to plug into its framework. Hardware devices such as PKCS#11-compliant smart card readers can be CDSA-compliant, as can digital certificate services from Public Key Infrastructure (PKI) solution providers and even the newer Simple Public Key Infrastructure (SPKI) authorization certificate services that are now starting to appear. In fact, CDSA can allow an application to select among multiple available security methods based on the need for different levels of security. For example, one employee may retrieve business information on the network using a private key that is stored in software, while a high-level executive with greater access to sensitive information must use a private key stored on a smart card.

### ...and Exportable

As a result of a recent and groundbreaking change in U.S. encryption regulations, open-source security software such as CDSA can now be freely exported (except to Cuba, Iraq, Libya, Yugoslavia, North Korea, Iran, Syria, and any other country against which the U.S. has a goods embargo). In addition, U.S. companies will now be able to provide technical

assistance to companies around the globe on CDSA software. This fundamental change in regulations ends the isolation between developers in different countries and allows standards-based security code to be available for use worldwide.

### **Open Source Benefits**

In addition to enabling worldwide use of CDSA technology, open source CDSA software itself can be more broadly used due to lower costs, greater industry attention, and increased collaboration. CDSA source code will be publicly available for download on the Internet, free of charge from the IAL area of the Intel Developer Web site.

Companies can view the source code to verify for themselves that no “backdoors” or security holes exist in the software. Open source allows reuse of protocol components to ensure interoperability. Experience with open source technology such as Linux reveals that companies can often resolve problems by examining and modifying the working code, or by collaborating with open source developers on a fix. Ultimately, the result of this open scrutiny and collaboration is software that is significantly more robust and reliable.

### **Enabling e-Business**

Because of the tremendous opportunity presented by the Internet, there will be an ever-increasing need to conduct business and exchange information online. Current impediments to growth include disparate and non-interoperable security technologies. For e-Business to thrive, everyone must have confidence that data, services, and transactions will be secure.

CDSA facilitates the dynamic use of data encryption, digital signatures, digital certificates, and provides a framework for establishing trust policy and authorization. As a result, the open source of CDSA will serve to accelerate the creation and deployment of interoperable e-Business security solutions.

### **Summary**

CDSA provides a way to overcome the current challenge of including security services in applications so valuable corporate assets are protected. By establishing a no-cost, interoperable, open infrastructure for accessing security services, CDSA can give an application access to a variety of security resources, regardless of platform, operating system, or type of service. Businesses that adopt CDSA-compliant security products can focus on their core competencies rather than on implementing and updating numerous distinct security solutions—and that’s smart business.

### **More Info**

For more information about the Common Data Security Architecture visit the IAL area of the Intel Developer Web site.

To view the CDSA specification, take a look at “Common Security: CDSA and CSSM, Version 2” in the Publications and Standards area of The Open Group’s Web site.

### **Author Bio**

Lelia Barlow joined Intel in 1997. She works in Security Technology Lab (STL), part of Intel Architecture Labs, as technical marketing engineer for the Common Data Security Architecture (CDSA) standard. Previously, she worked in Intel OPSD Desktop Motherboard engineering. Lelia has also been an instructor with Saturday Academy, a community-based pre-college department of the Oregon Graduate Institute of Science and Technology. Her program, “GEEK CHIC,” was created to interest middle- and high-school girls in electrical engineering. She holds a B.S.E.E. from Oregon State University.

## Columns

### *Inside Looking In*

#### What Do You Do When You're Branded?

Tim Mostad  
Senior Technical Marketing Manager  
Intel Corporation

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#### Column

No, this isn't a long-lost episode of the 1960's Chuck Connor's television series that chronicled the disgrace of a cavalryman, although there's every reason for me to be mindful about my own career as I discuss branding. Inside Intel we take branding very seriously. I've yet to see an Intel brand manager break anyone's sword, rip off his insignia, and then banish him to the wilderness frontier that lies outside the company's front door. But I have to believe abuse of the brand could mark you with a coward's shame, just like poor old Chuck.

As with any household name, Intel spends a lot of time, effort, and money making the Intel brand mean something to customers. The people on the walls of the fort guarding our brand don't have much of a sense of humor about anyone threatening an assault.

The value of a brand is undeniable. Pick your favorite product, and then imagine trying to find it if it looked different every time you tried to buy it. Worse yet, imagine that when you managed to buy the product it was different every time. Except in rare cases, the product would now have no brand value since you and other customers could count on nothing. Brands exist to establish recognition and trust. The degree to which customers like and want products and the extent to which those products consistently satisfy customers' needs helps to determine brand value. The worth of the best brands in the world is measured in tens of billions of dollars.

The branding troops here and in the industry might cringe at my layman's explanation, but the point is that once you have a valuable brand you don't take unnecessary risks with it. You wouldn't put your brand where one misfire could hurt it. This is why anyone inside our company who communicates officially to anyone outside has been drilled in the proper usage of the brand.

It has been said that a person's greatest strength is also his greatest weakness. The Intel brand is considered by the advertising industry to be one of Intel's greatest strengths, yet the brand also limits what we can do. Would you trust your "infant-ry" to Intel Inside® brand baby diapers? I shudder to even think about seeing that stamped on a baby's behind! Even if such products were conventionally superior to the best known products on the market you'd no more look for an Intel brand diaper than buy a George Custer brand microprocessor. For a brand to have value it necessarily has to have a clear, meaningful, and positive identity aligned with the company owning the brand.

Like a blacksmith, a valuable brand can forge a rough metal into a fine saber in the customer's mind. It conveys an instant image and evokes a visceral response. This is also true in the software business where I work. Like them or not, a handful of companies in this industry have brands with this sort of impact, the kind that communicates persistence and longevity. It seems we've reluctantly come to accept that software is so complex that it will always be less than perfect. Our trust in the brands attaches to the companies themselves. We believe they'll be around long enough to remove the burrs and hone the dull edges of their software, and this helps to keep them in mind as we consider our purchases.

Branding is so important inside Intel that the captains of the branding corps are quick to act when the ranks become unruly. My group recently tried to post a Web site. We had graphics that convey the "look and feel" of the pages, an essential part of brand identity, yet they were misaligned by one pixel. This was deemed an egregious error that had to be fixed before posting.

I'm a technical guy at heart, just trying to get out there every day and do a good soldierly job, building on what I've observed. As old Chuck learned a little too late, it pays to be as wary of that massive army of professionals looking over your shoulder as you are of the wilderness ahead. Go one pixel too far, son, and you're the one who's branded, marked

with a coward's shame. To answer the TV show's question, you pay close attention to your company identity to ensure your own. That's what you do when you're branded, when you fight for your name.

#### **Author Bio**

Tim Mostad continues to pursue technical marketing nirvana by applying his 19 years of Intel hardware experience to extending Intel's influence with software and Internet developers. As operations manager in Intel's Developer Relations Division, Tim focuses on the development of broad and efficient enabling processes and infrastructure, primarily through use of the Internet.

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## From the Editor

Donna Loveland  
Managing Editor  
Platform Marketing  
Intel Corporation

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### Column

In the Pacific Northwest corner of the United States, where *Intel Developer Update* has its home office, it's springtime.

The season is kinder here than in the northeastern corner of the country where I grew up, and it's already well underway. My mother, who still lives back East, tells me she was gardening in 70-degree weather one day last week and was outside again the next, rescuing hyacinths from under four inches of snow.

In my garden, the hyacinths recently gave way simply because they'd lived out their fragrant little lives and it was time for them to make room for the tulips.

Change in our industry isn't always seasonal or orderly. In fact, colorful and smelly are probably more consistent characteristics. But if you plan carefully and the environment cooperates, the progression of change can be a beautiful thing to behold.

At the risk of sounding flowery, let me say that the May issue is blooming with articles on just that kind of change, the kind backed by well-considered planning that takes the industry environment into account.

*New Low-Power Modules for Applied Computing* not only gives details on the latest line of modules based on the Intel® Pentium® III processor, it also describes a plan to provide continued support for embedded products that have reached the end of their life cycles.

*CNR Card Offers Motherboard Expansion* talks about change in the form of upgrading with a Communication and Networking Riser card that combines features and, at the same time, reduces space and enables small form factor designs.

*Higher Performance Peripherals with USB 2.0* details changes within the USB specification that are opening the way for the kinds of external peripherals that vendors could previously add only by using the PCI bus and other nonstandard high-speed buses.

*Intel® Automatic Organizer Software* unveils a toolkit already being used by major software companies to fight information overload, boost productivity, and bring the ever-evolving PC a step closer to becoming a true personal assistant through applications that categorize information.

*Internet and Broadcast: the Key to Digital Convergence*, an executive summary of a new Intel white paper, discusses a change Web developers and broadcasters have seen coming for years and tells how converging technologies can expand their customer bases, products, services, and revenue sources.

*CDSA Brings Security into the Open*, this month's cover story, describes the Common Data Security Architecture, an interoperable security framework conceived and implemented by Intel and adopted by The Open Group\* in 1997. In May, Intel plans to deliver Release 3.0 of the reference implementation, making it available for free download and use as a way to foster the growth of e-Business.



Support your own growth this spring by learning the latest on Intel developments from the pages of May's *Intel Developer Update* magazine.

Enjoy.

**Author Bio**

Donna Loveland is the editor of *Intel Developer Update* magazine. She joined Intel's Platform Marketing group in 1999 as the editor of Platform Solutions News. Donna began her career with Intel in 1982 as a technical editor in an advanced microprocessor development group. Since then, she's held technical and marketing positions in leading-edge technology areas ranging from stereoscopic display to digital broadcast to scalable online content. Donna has a B.A. degree in English from the University of Rochester and an M.A. in Expository Writing from the University of Iowa.

## Departments

### *Applied Computing*

#### **New Low-Power Modules for Applied Computing**

Bob Ferrar  
Director of Marketing  
Embedded Intel Architecture  
Intel Corporation

#### **Overview**

The world of embedded technology has expanded over the past several years. For developers, the word “embedded” now brings to mind a range of applications, from traditional 8-bit microcontrollers and early microprocessor-based products to newer high-performance, connected, applied computing applications designed for dedicated use.

Intel is committed to the applied computing market segment consisting of high-performance, connected, dedicated-use applications. We’re developing products that address development issues like thermal management, space constraints, low-power needs, and higher integration. Commitment to this market segment also includes development of an extended-life, high-performance roadmap, long-term manufacturing support plans, forward-looking pricing, and both business and technical support models to meet the needs of a variety of products, applications, and customers.

On February 15, 2000, Intel announced what is expected to be the final low-power module to be added to the extended-life roadmap for applied computing. This module features the Intel® Pentium® III Processor–Low Power at 500 MHz. Providing a scalable solution for existing low-power modules, the Pentium III Processor–Low Power Module has 256 Kb of on-die cache, a 100-MHz processor system bus, and the 82443BX host bridge controller. As with previous modules, the Pentium III Processor–Low Power Module life cycle is planned for three years plus a product discontinuance period. Part of this solution includes a support plan for these products beyond maturity.

#### **Intel® Low Power Modules**

Intel low-power modules are small, highly integrated products designed to provide applied computing customers with an easy-to-use building block for their high-performance, connected, dedicated-use applications. These low-power modules incorporate state-of-the-art technologies, like Intel’s 0.25-micron manufacturing process for the Intel® Pentium® II Processor–Low Power Modules and 0.18-micron manufacturing process for the Pentium III Processor–Low Power Module.

Designers appreciate the module concept for a number of reasons: ease of use, functionality, thermal management, and form factor. Ease of use in design is a key value, as these products combine the processor, high-speed L1 and L2 cache, and other supporting components into a convenient all-in-one unit. With the processor-to-chipset layout already complete, the designer need only determine the interface to a common system bus (PCI, memory, etc.). Like their desktop counterparts, the low-power modules equip the latest embedded systems with features such as the Dual Independent Bus (DIB) architecture and dynamic execution.

The DIB architecture is designed to offer up to three times the bandwidth performance of single-bus architecture. This functionality and data capacity combines innovative data processing techniques. Data can be more intelligently and efficiently manipulated, and software instructions predicted and analyzed to optimize processor work load.

Another advantage of the low-power module family is the simplified thermal management that results from lower power consumption. In addition, the modules’ low profile makes it a more appealing form factor for space-constrained designs, common in applied computing applications. The overall dimension of each unit is 4" x 7.5" x .39". Finally, each of these modules is designed to be fully compatible with the previous product, providing an easy migration upgrade path.

All Intel low-power modules have full technical support during their planned life cycle. This support consists of datasheets, application notes, design and routing guidelines, and evaluation kits to support quick time-to-market. You can also find addresses and phone numbers for Intel site offices and support centers worldwide through the worldwide contacts area of the support Web site. Additionally, customers can register for proactive notification of product changes via the Product Change Notification Index.

Intel understands that some customers may want module products that feature Intel® processors and product support past the planned Intel extended life cycle. To address this demand, Intel has announced cooperative efforts with Ziatech Corp. and Teknor Applicom, Inc., to enable them to supply their own Intel processor-based module products.

### Summary

The latest edition of the 500-MHz Pentium III Processor–Low Power Modules for applied computing provides a scalable upgrade migration path from the previous Pentium II Processor–Low Power Modules at 266 and 333 MHz. These products are valuable for their ease of use, functionality, thermal management, and form factor. In addition to providing technical support, Intel has been working to enable both Ziatech and Teknor Applicom to supply their own Intel processor-based module products.

Intel's commitment to the applied computing market segment is solidified by a growing extended life cycle roadmap with forward-looking pricing, a long-term manufacturing support plan, and both business and technical support. The Intel low-power module family is the latest example of the way Intel is tailoring support for mature products to meet the specific needs of this market segment.

### More Info

For more technical information on designing with Intel's low-power modules, visit these areas of the Intel Developer Web site:

- Low Power Modules for Applied Computing
- Development Kits
- Intel Pentium III Processors for Applied Computing
- Intel Pentium II Processors for Applied Computing
- Intel Product Change Notification

For full referenced press releases visit:

- New Module Solutions–Building Blocks for Applied Computing, February 15, 2000—see New Module Solutions
- Teknor Applicom Press Release on Intel-compatible modules, February 24, 2000

### Author Bio

Bob Ferrar is the director of marketing for Intel's Embedded Intel Architecture Division. In 1986, he joined Intel's Chandler Microcomputer Division in test engineering. From 1987 until today, his activity has been centered in new business start-ups focusing on product development and strategic marketing in embedded markets including graphics, telecom, wireless, Internet appliances, video, network terminals, and Applied Computing. Bob received a B.A. degree in Chemistry from Jamestown College and an M.B.A. from the University of Phoenix.

## Desktop

### CNR Card Offers Motherboard Expansion

K.L. Yeung  
Senior Product Marketing Engineer  
DPG Platform Marketing  
Intel Corporation

#### Overview

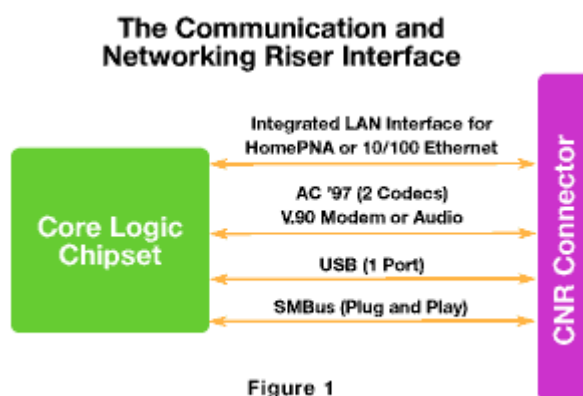
The Communication and Networking Riser (CNR) card provides OEMs and system integrators with a high-quality, flexible sell-up option while maintaining a price point that is less than a PCI add-in card. Contributing to this flexibility is support for all of the ATX family of form factors, with both standard/full height and low-profile cards defined. The multitude of features that can be added on a single card, such as LAN, home phone networking, V.90 analog modem, audio, and USB, make the CNR a compelling technology for all segments of the PC market.

Besides added flexibility, the CNR offers a number of advantages. The CNR addresses the space constraints and electrical interference of the motherboard and offers system integrators the opportunity to add value to desktop systems. In addition, the CNR makes it possible to ship more than one feature—or a combination of features—on a single platform, and allows separation of certification requirements from the motherboard. As a low-cost, flexible desktop riser, the CNR offers the solution for implementing a variety of communications and networking technologies, without sacrificing the PCI slot.

#### Flexible Design

The backbone of the CNR interface consists of an AC '97-compliant AC link, a LAN interface, an SMBus interface, and a USB interface. As Figure 1 shows:

- The AC '97 interface supports up to six channels of audio and/or modem functions on the CNR board.
- LAN interfaces provide one of two LAN interfaces for networking functions. These interfaces enable 1-Mbps HomePNA, basic 10/100-Mbps Ethernet, or 10/100-Mbps Ethernet with Alert on LAN\*.
- The USB interface supports a variety of technologies or functions implemented on a USB interface.
- The SMBus interface provides the CNR board with plug-and-play functionality.



*Note: these connections are point-to-point and might not be present in all systems. Check with the motherboard supplier.*

## Configuration Options

In the CNR architecture the audio, modem, and LAN subsystems can be partitioned in several different ways. This freedom gives system integrators the opportunity to design according to individual system need and end use. There are many different CNR card configurations, including these examples:

- *Integrated on-board audio, with CNR modem and home phone networking*—This configuration deploys the audio codec on the motherboard, with both the modem and home phone networking on the CNR board.
- *Integrated on-board audio, with CNR 10/100 LAN*—The audio codec is deployed on the motherboard, and the 10/100-Ethernet-based LAN PLC/PHY device on the CNR board.
- *Combined CNR card with audio/modem and home phone networking*—An AMC '97-combined audio/modem code with a phone line PLC/PHY device introduces a higher level of integration and possibly a lower implementation cost.
- *Multichannel audio upgrade*—An audio codec is deployed on the motherboard, with an additional audio codec on the CNR board, allowing a single motherboard to produce multichannel audio.

## Support for ATX Form Factors

The CNR specification defines a new riser solution for ATX, microATX, and FlexATX Form Factors, and offers system manufacturers a lower implementation cost for network, audio, modem, and future technology. This allows system manufacturers to integrate a feature-rich desktop PC using an ATX motherboard with basic features.

## USB Options

The CNR card supports a USB Hub for multichannel USB expansion and allows future expansion to new technologies, including xDSL or wireless.

## Flexible Network Solutions

The CNR provides three Intel® LAN options with a single driver for added flexibility. These include 1-Mbps HomePNA, basic 10/100-Mbps Ethernet, and 10/100-Mbps Ethernet with Alert on LAN (AoL). AoL emits an alert in the event of software failures or system intrusion, even when the operating system is not present or the system is suspended.

## Summary

As PC user demands for complex interactive applications grow, industry trends toward lower cost are driving the need for higher levels of integration across all PC platforms.

Intel's new Communication and Networking Riser (CNR) delivers a hardware-scalable motherboard riser and interface that supports audio, modem, USB, and LAN interfaces at a lower bill of materials (BOM), or system cost, than industry-standard expansion slots or proprietary methods can achieve.

## More Info

For more information, see:

- Communication and Networking Riser (CNR) Web site on the Intel Developer Web site.
- Intel's February 7, 2000 news release announcing CNR specifications (located in the News Archive area of Intel's online Press Room)

## Author Bio

K.L. joined Intel's Platform Marketing Group in 1999, following 12 years as a marketing manager for OEM and handheld test and measurement products at Tektronix, Inc. A native of Hong Kong, K.L. holds degrees in Electronic Engineering from Hong Kong Polytechnic University and in Business Administration from the University of East Asia. K.L. moved to the United States in 1994, and has earned numerous awards for excellence during his career.

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**Higher Performance Peripherals with USB 2.0**

Steve McGowan  
Peripherals Manager  
Intel Architecture Labs  
Intel Corporation

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Brad Hosler  
USB Engineering Manager  
Intel Architecture Labs  
Intel Corporation

**Overview**

Peripheral vendors should look seriously at USB 2.0 if they have products that need more bandwidth on USB 1.1, or if they were unable to port their devices to USB 1.1 because it lacked the required bandwidth.

Universal Serial Bus 2.0 is an evolution of the USB standard that creates opportunities for high-performance external peripherals that vendors could previously add to a PC only by using the PCI bus and other nonstandard high-speed buses. USB 2.0 can handle high-speed peripherals up to 480 Mbits/sec. This makes it a compelling alternative to parallel bus solutions, which require opening the box for installation.

USB 2.0 provides a straightforward performance enhancement to USB 1.1 and offers backward compatibility with USB 1.1 devices and hubs. USB 2.0 preserves the dynamic attach/detach model, power distribution, and power management features introduced in USB 1.1. The system software will comprehend the increased capabilities of USB 2.0 peripherals so that it can optimize performance. By using the same cables, connectors, and software interfaces, USB 2.0 will be fully compatible—both forward and backward—with USB 1.1. No changes will be required for applications and most device drivers.

Across the PC industry, developers from companies of all kinds are working in concert to make USB 2.0 ramp smoothly and quickly and deliver new capabilities to their customers.

**Need for Speed**

What's new is that USB is now a three-speed bus. USB 2.0 will continue to support the 1.5-Mbit/sec. bit rate for human interface devices and the 12-Mbit/sec. rate currently supported by USB 1.1. With a top-end signaling rate that is 40x faster than USB 1.1, USB 2.0 provides outside-the-box connectivity for a wider range of peripherals that add functionality while complementing PC performance. USB 2.0 hubs and hosts will need to support all three speeds, while USB 2.0 peripherals will need to support one or more of the speeds.

One of the nicest features of USB 2.0 is its ability to support multiple high-speed peripherals running simultaneously. USB does not employ speed-shifting, so low- and full-speed devices will use the bit rate equivalent of USB 2.0 bandwidth. For example, a 6-Mbit/sec. USB camera that required 50 percent of USB 1.1 bandwidth will require less than 2 percent of the available USB 2.0 bandwidth. This leaves a lot of room for other devices to share the bus.

Another advantage of working with USB 2.0 is there are already over 100 million existing ports where a USB 2.0 device can operate. This gives vendors the added comfort of knowing that their device will work in today's systems and that it will work even better in newer USB 2.0-enabled systems.

USB 2.0 supports new peripherals and capabilities:

- *Video conference cameras* with bandwidth up to 70 Mbits/sec. can support MPEG-2 video quality, without compression.
- *Scanners* with bandwidth of up to 100 Mbits/sec. and higher will no longer require SCSI connection to provide higher resolution and acceptable scan times.
- *Printers* with bandwidth of up to 100 Mbits/sec. and higher will be able to deliver more colors and print more quickly. Developers will have the option of eliminating line/page buffers to hit lower cost targets.
- *External storage peripherals*, including removable storage and high-speed CD and CD-R devices, with bandwidth of 240 Mbits/sec. and higher will gain the versatility of USB.

- *Broadband connections*, including cable modems, DSL, Ethernet, and home networking devices, can be installed without opening the PC.

## Design Options

Peripheral developers have three basic USB 2.0 design options to choose from, each of which allows them to focus on their peripheral functionality and not have to design and develop the high-speed USB 2.0 buffers themselves:

*Option 1*—Use a microcontroller with integrated support for USB 2.0. This good time-to-market option lets hardware vendors concentrate development resources on product differentiation and functionality. Some firmware will need to be written.

*Option 2*—Use a discrete transceiver. Transceiver choices come both with and without Serial Interface Engine (SIE) functionality and can be selected based on how well they fit the peripheral design. Logic to connect to the transceiver can be developed in-house or from a standard VHDL core provider. This design approach provides good time-to-market characteristics as well as the ability to optimize the design for highest performance.

*Option 3*—Go with a full ASIC design that integrates device-specific logic, an SIE, and a USB 2.0 transceiver. While this approach involves longer design and qualification times, it also helps reduce cost for high-volume products. Developers who take this track quickly realize that they can't use standard gates for the transceiver. The solution is the USB 2.0 Transceiver Macrocell Interface specification developed by Intel. This spec provides a standard interface across all silicon foundries and enables easy connection to standard gates. The Macrocell specification is posted on the Intel Developer USB Web site. To date more than 50 companies have registered to receive the Macrocell Interface specification including about 10 foundries.

Suppliers of these various types of design options (including silicon, IP, foundries, etc.) are listed in the Building Block Vendor List, a compilation of vendors intending to ship USB 2.0 products this year. It can be found in the developer area of the USB Web site.

## Development Tools

Peripheral developers who want to get an early start on USB 2.0 development should obtain a Peripheral Developers Kit (PDK). The USB 2.0 Peripheral Developers Kit (PDK) includes tools developers can use to create a USB 2.0-compliant host system in order to test and debug their products. PDK contents include:

- USB 2.0 host controller on a PCI add-in card
- USB 2.0 software stack for at-speed testing
- Software to generate USB 2.0 transactions

Information on the PDK will be posted on the USB Implementers Forum Web site. PDKs will be available in the middle of Q2 '00.

USB 2.0 bus analyzers are also available in versions for packet level and electrical analysis. Vendors are listed in the Building Block Vendor List in the "Design Options" section.

## Development in Full Swing

The USB 2.0 specification Release Candidate was published in March 2000 for industry review. Industry development is in full swing, and dozens of companies are targeting products for availability in the Holiday 2000 time frame.

The world's first public USB 2.0 demonstration took place at the Intel Developer Forum Spring 2000. The demos included a USB 2.0 scanner and storage connected to a PC via a standard USB cable. This provided a good indication of the progress being made in developing USB 2.0 industry solutions.

## Summary

Universal Serial Bus 2.0 offers a compelling opportunity for peripheral vendors to migrate their USB peripherals to higher performance while still being able to sell existing USB peripherals into the huge installed base of USB-capable PCs.

USB 2.0 makes it possible to support a wide range of higher bandwidth of PC peripherals, including scanners, cameras, and mass storage devices, with the user-friendliness and ease-of-installation of USB.

The evolution to USB 2.0 is well underway. The USB specification and development tools are available, and compliance workshops are attracting the interest of hardware developers. During 2000, USB 2.0 will lead to the development of higher performance peripherals that will bring more application performance and functionality to the PC.

**More Info**

Information on USB 2.0 and the specification itself are available at the USB Implementers Forum Web site.

See and hear about the latest in USB 2.0 at the USB Developers Conference, May 15 through 18 in Anaheim, California. Tracks cover the details of the specification, how to develop peripherals, putting USB 2.0 into systems, the USB 2.0 compliance program, and more. You can register at the USB Implementers Web site.

The tools area of the site also provides a complete list of USB building block and tool vendors and their USB 2.0 products.

**Author Bio**

Steve McGowan leads Intel's efforts with the Universal Serial Bus 2.0 Transceiver Macrocell (UTMI) Specification. He began his career with Intel in 1996 as a member of the USB group within Intel Architecture Labs, where he served as a key contributor to the USB 1.1 portion of the Human Interface Device (HID) Specification. Steve came to Intel from a startup company in the business of developing virtual reality technology. In his prior work with Northern Telecom, Steve focused on fault-tolerant directory assistance systems. He holds a B.S.E.E. from Marquette University.

Brad Hosler is the Intel USB and USB 2.0 engineering manager at Intel Architecture Labs. Brad has been with Intel for over 15 years and has specialized in the development of I/O bus technologies, most recently PCI and USB. He holds a B.S.E.E. from Bucknell University and an M.S./C.E. from the Carnegie Mellon University.



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## **Initiatives and Technologies**

### **Intel® Automatic Organizer Software**

Stephen Sieron  
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#### **Overview**

As they studied ways to enhance PC productivity, Intel Architecture Labs (IAL) ethnographic researchers were amazed to discover how much time computer users spend combing through their previously read e-mails and attachments, searching for isolated snippets of important information.

IAL responded by developing Intel® Automatic Organizer software, a toolkit designed to fight information overload, boost productivity, and bring the PC a step closer to becoming a true personal assistant.

Intel Automatic Organizer software can be used by developers to build a diverse set of new applications which can automatically categorize e-mail, news, Web pages, and other text-based files. IAL is working with software companies, including Novell, Inc., Metastorm, Inc., and Enfish Technology, Inc., to accelerate the delivery of Intel Automatic Organizer software to users.

Developers can integrate Automatic Organizer software into and across their data applications to create a better and more productive computing experience.

#### **Battling Information Overload**

With the continued explosive growth in computer and Internet usage, the amount of information available to knowledge workers continues to expand.

For example, International Data Corporation reports that the information available on corporate intranets will grow by 40x between 1998 and 2002 (Knowledge Management—A Practical Approach, March 1999). A Pitney Bowes/Institute for the Future study on information overload (“Managing the Mountain,” *Wall Street Journal*, Monday, June 21, 1999) shows the average knowledge worker sends and receives 200 total electronic, voice, and handwritten messages a day, and the number of e-mail messages continues to grow rapidly each year.

A product of Intel’s Information Management initiative, Automatic Organizer software is a powerful tool in the battle against the deluge of information faced by today’s connected PC users.

#### **How It Works**

Automatic Organizer software performs a statistical analysis of entire documents to identify themes and common patterns from text, and to determine the information that is most relevant to the individual user. Applications can be built which allow users to easily provide profile data to “train” the software. Additionally, users can be given the ability to quickly refine their individual profiles at any time.

Automatic Organizer software offers many exciting benefits for both users and developers. For example, a user can have the Automatic Organizer software place a news article in a certain category, rank it according to relevance, or use the software to filter or retrieve some specific information.

By using the Automatic Organizer software, developers can add the power of context-based relevance technologies to their applications without devoting valuable time and resources to developing these capabilities internally. There are numerous market opportunities to integrate the software into vertical applications.

Health care professionals, for example, could set up the software to assist in a diagnosis by comparing a new patient's record to data in other patient files. Legal researchers could use Automatic Organizer software to categorize case files by relevance to a specific point of law.

The Automatic Organizer software can be licensed by qualifying developers with an interest in building exciting new applications to reduce information overload.

### **New Applications**

Metastorm Infowise\*, and Enfish Onespace\* are two new applications that integrate Intel Automatic Organizer software.

Metastorm Infowise, a knowledge management tool for Novell GroupWise\*, is an electronic mailbox assistant that searches through all the messages and attachments in a user's GroupWise desktop and presents related data to solve a problem, complete a task, or answer a question.

"With Infowise and the underlying Intel Automatic Organizer software, users won't have to continually struggle with the frustrating and time-consuming task of locating and organizing their relevant messages, attachments, and tasks," says Brian McPhee, vice president of marketing at Metastorm.

Metastorm Infowise organizes a user's mailbox and is a better and smarter way for Novell GroupWise users to become more organized and productive.

"Metastorm Infowise is a key component in Novell's commitment to give GroupWise customers access to relevant information anytime and anywhere, allowing them to simplify information management on the Internet," says Leif Pederson, director of product management for Novell GroupWise.

Enfish Onespace is a personal desktop portal that puts together a user's desktop with the Internet in a way that automatically integrates e-mail, documents and other personal files with timely, relevant information from the Internet. This enables PC users to work with all their information in one place.

"Intel Automatic Organizer software was easily integrated into Enfish Onespace," adds Louise Wannier, CEO and chairman of Enfish Technology, Inc. "It enhances the user experience by providing streamlined information right to the desktop."

### **Relevance Technologies**

Intel Automatic Organizer software components use variations on a number of advanced relevance technologies, including categorization, profiling, and clustering algorithms. Here is a brief description of each of these relevance technologies:

*Categorization algorithms*—Starting with a set of user-provided sample documents, the software uses statistical techniques including vector classification and rule induction to find and group similar documents. Categorization algorithms can be utilized to automatically place each incoming document into a folder, which contains a collection of similar content.

*Profiling algorithms*—The software provides components that can analyze both Web pages and groups of documents and messages. This information can then be used to build a precise characterization of the interests for each individual user. In a corporate environment, one of the ways profiling can be used is to find and build communities of interest for the exchange of information

*Clustering algorithms*—Clustering components in the software examine a collection of messages, Web pages, and other documents. Each of these pieces of information can then be grouped according to common themes in the information collection. This technology is very useful for quickly organizing large collections of information and can simplify user navigation.

Automatic Organizer software components are designed as COM (Component Object Model) objects, allowing these components to be readily incorporated into new applications. Each of the software components in the toolkit has its own page that describes algorithms and methods in more detail. Software code is included in both Microsoft Visual Basic\* and Visual C++\*.

## Summary

Intel Automatic Organizer software enables developers to build applications that automatically categorize e-mail, Web pages, attachments, and other types of documents to let users quickly get to the right information at the right time. Intel Automatic Organizer software can be readily integrated into new and existing applications to provide users with a better and more personalized computing experience. The software also shares information across applications, and enables users to get more out of their PCs' processing capabilities.

Grounded in end-user research and developed by the Intel Architecture Labs (IAL), Automatic Organizer software is based on advanced relevance technologies. New products from software companies Metastorm, Inc. and Enfish Technology, Inc. are the first applications to be integrated and enhanced with Intel Automatic Organizer software.

PC personalization is a growing trend in the software industry. The integration of Automatic Organizer software into innovative applications is a big step toward making the PC a true personal assistant.

## More Info

Visit the Intel Architecture Labs Web site for detailed information on Automatic Organizer Software and Intel's Information Management Initiative.

Novell GroupWise is an industry-leading GroupWare product. More information on GroupWise can be attained from the Novell GroupWise Web site.

Metastorm Infowise is now available by Web download for evaluation and purchase.

More information on Enfish Onespace can be obtained from Enfish Technology, Inc.

## Author Bio

Stephen Sieron is a marketing manager with Intel Architecture Labs (IAL). He currently manages Intel's information organization and personalization capability, including the diffusion of information management technologies, concept evangelism, and strategic planning.

Steve's Intel experience includes product management in the branded desktop board group within the Reseller Products Division, where he managed product definition, positioning, and messaging to support Intel's worldwide product dealer channel.

Steve holds an M.B.A. from Duke University and a B.S. in Industrial and Systems Engineering from Ohio State University. Prior to earning his M.B.A., Steve worked as a senior consultant at Ernst & Young International Ltd., as a product manager at Hewlett-Packard Company, and as an industrial engineer at IBM Microelectronics.

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**Internet and Broadcast:  
the Key to Digital Convergence**

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**Executive Summary**

The dramatic growth of the Internet, combined with the spread of digital broadcast worldwide, is leading Web producers and broadcast professionals to the realization they have a great deal in common. Larger, faster Internet “pipes” make it possible to deliver better-integrated media content, while broadcast is incorporating dynamic Web-style interactivity and information for a more customizable viewer experience.

The convergence of Internet and broadcast technologies present opportunities for Web developers and broadcasters to utilize the best tools from both industries to expand their customer base, products, services, and revenue sources. Web developers are beginning to adapt content using digital broadcast broadband capabilities to overcome bandwidth restrictions and platform diversity. And broadcasters are utilizing dynamic Web-style interactivity and programming to create more personal, customizable viewer experiences.

As they create and deliver enriched content made possible by digital technology, both Internet and broadcast companies continually see ways convergence can change both industries.

*Content creation*—Whether it’s video, audio and music, Web pages, graphics or animation, both Internet and broadcast content providers rely on similar applications and process to create a rich, interactive viewing experience for end users.

*Audience reception*—From PCs to PC DTV, from Web appliances to the standard 19-inch TV, audiences all over the world are beginning to see the possibilities offered by connected, interactive, high-quality entertainment.

*Opportunity*—Traditional broadcast content providers are serving the Web market by refining products and services to meet demands for “deeper” levels of information and increased interactivity. At the same time, Internet content providers are capitalizing on new delivery capabilities.

Internet and broadcast professionals are looking to digital technology to deliver what audiences want, when they want it. For more information on what convergence can do for the broadcast and Internet industries, see the complete Intel white paper, “Internet and Broadcast: the Key to Digital Convergence,” posted on the Intel Architecture Labs Web site in the box labeled, “Budding Opportunities in Digital Convergence.”

—End of Intel Developer Update Magazine Issue 8—